

**REMARKS**

**Claim Rejections Under 35 USC § 102**

**Claims 14-15 are rejected under 35 USC §102(b) as being anticipated by Itaya et al. (U.S. Patent No. 5,780,873).**

It should be noted that a semiconductor device comprising a structure of “substrate/amorphous/substrate” does not always have a “linear current-voltage characteristics”, they may have very difficult requirements though they may have similar structures. That is, there are cases where the linear current-voltage characteristic does not exist depending on the material of substrate. In the descriptions of the present invention, it is proved and described exactly that the “linear current-voltage characteristic” is obtained by a “GaAs substrate/amorphous/InP substrate” structure.

On the other hand, Itaya discloses “GaAs substrate/amorphous/GaN substrate” and Poprek discloses a bonded structure of a GaAs substrate and an InP substrate.

However, in Itaya, there is no suggestion regarding the “linear current-voltage characteristic” and that, to begin with, no corroboration is publicly known that the “linear current-voltage characteristic” is obtained by the Itaya’s “GaAs substrate/amorphous/GaN substrate” structure. This characteristic is also not suggested in the Itaya’s descriptions. Thus, even if the “bonded structure of the GaAs substrate and the InP substrate” of Piprek is combined to Itaya, the present invention would not result. This is apparent from the facts that there is neither description nor suggestion of the “linear current-voltage characteristic” in Itaya and interestingly, a “nonlinear current-voltage characteristic” is a premise (Fig. 1) in Piprek.

To obtain the “linear current-voltage characteristic”, the present invention adopts an original structure of “GaAs substrate/amorphous/InP substrate” which was corroborated experimentally by inventors to obtain this characteristic. Accordingly, the structure is as specified in claim 1 in that an amorphous is formed at an interface between an InP substrate and a GaAs substrate to obtain the “linear current-voltage characteristic”, and the structure is also as specified in claim 14 in that the interface between both substrates has the “linear current-voltage characteristic”. Furthermore, there is added new claim 20 having both the structure of “GaAs substrate/amorphous/InP substrate” and the structure that the interface between both substrates has the “linear current-voltage characteristic”.

More specifically, in the outstanding Office action, the Office acknowledges that there is not a disclosure or teaching in Itaya that the amorphous layer has a linear current-voltage characteristics. However, to reject the claimed invention anyway, the Office stated that “Itaya et al. do not explicitly teach the amorphous layer has a linear current-voltage characteristic. However, this feature is inherent in Itaya’s device because the structure of Itaya is identical with the claimed structure.”

Therefore, it is the firm Office position that Itaya discloses a structure identical to that of the claimed invention. The structure of the claimed invention is clearly shown by way of an example in Figures 1A and 5, which are correspondingly described on page 8 line 15 to page 10 line 9, and page 15 line 1 to page 19 line 17.

In contradistinction, the Office action specifically asserted Fig. 6 of Itaya which is described between column 10 line 44 and column 12 line 28.

From comparing differences in structural depictions between Figs. 1A and 5 of the present invention with Figure 6 of Itaya, as well as comparing differences in their written descriptions, it is clear that the Office conjecture "the structure of Itaya is identical with the claimed structure" is factually disputed by the disclosure of the present invention and the disclosure of Itaya. Naturally, as the structure of Itaya is indeed not identical with the claimed structure, there is not any alleged inherent feature.

Furthermore, as also admitted in paragraph 5 of the outstanding Office action, "Itaya et al. do not teach the first semiconductor substrate being an InP substrate. As it is widely known to a person of ordinary skill in the art, even if there are identical structures, which there are not, differences in material would also cause differences in characteristic. Therefore, this Office admission of differences in material would also cause reasonable doubt as to the validity of the Office conjecture that Itaya discloses a linear current-voltage characteristic.

Regarding inherency, MPEP 2163.01(a) has specifically stated that:

"To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999)

Therefore, it is both a Patent Office position as well as a Court position that to establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or

possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.

Should the Office continue to assert that the claimed invention is inherent, the Applicant respectfully requests extrinsic evidence that makes clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Namely, any extrinsic evidence that the amorphous layer has a linear current-voltage characteristic.

#### **Claim Rejections Under 35 USC §103**

**Claims 1-6 and 16-18 are rejected under 35 USC §103(a) as being unpatentable over Itaya et al. (U.S. Patent No. 5,780,873) in view of Piprek et al.**

The outstanding Office action has specifically stated that “Itaya et al. do not teach the first semiconductor substrate being an InP substrate.” The Applicant agrees with this Office assessment of the shortcoming of Itaya.

To supplement this defect, the outstanding Office action asserted Piprek citing its long-wavelength advantages. However, in addition to citing this advantage, Piprek itself actually raised doubt regarding its long term reliability. More specifically, Piprek stated that:

“However, a number of questions remain concerning the nature of the fused junction, and its effect on performance and long-term reliability of the laser. In particular, the current-voltage (I-V) and light-current (I-I) curves often show abrupt

self-switching, as illustrated in Fig. I. We present here the first detailed analysis and physical explanation of this switching phenomenon.”

In addition to this long-term reliability issue, Piprek also cited a number of defects by stating that:

“Assuming mid-gap donor-type interface defects, abrupt self-switching can be reproduced by numerical VCL simulation. Figure 3 shows calculated energy band profiles along the VCL axis. At zero bias [Fig. 3(a)], interface charges create an energy barrier for holes which is much larger than the GaAs/InP band offset. In fact, the defects render the GaAs/InP interface n-type. The resulting npnp-device is similar to a Shockley diode switch. With current injection, the center pn-junction becomes increasingly reversed biased [Fig. 3(b)]. The switching event is triggered by enhanced injection of holes (from p-GaAs) and electrons (from the MQW) into the reverse biased junction. After switching, interface defects are partially discharged and the hole barrier is substantially reduced [Fig. 3(c)]. The light power drops due to increased electron leakage from the MQW. Our presentation also discusses processing effects on the self-switching as well as the possible nature of the defects.”

Therefore, it is clear that Piprek actually admitted to long term reliability problems as well as defects.

Section 2143 of the MPEP has specifically stated that:

“To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference must teach or suggest all the claimed limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant’s disclosure. *In re Vaeck*, 947 F.2d 466, 20 USPQ2d 1438 (Fed. Cir. 1991).”

Therefore, it is both a court position and a Patent Office position that to establish a *prima facie* case of obviousness, 1) there **must be** some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the

reference or to combine reference teachings; 2) there **must be** a reasonable expectation of success; and 3) the teaching or suggestion to make the claimed combination and the reasonable expectation of success **must both be** found in the prior art, and not based on applicant's disclosure.

Given the long term reliability problems and defects, the there must be a reasonable expectation of success test of establishing a *prima facie* case of evidence cannot be passed.

Therefore, the claimed invention is not rendered obvious by the combination rejection.

Furthermore, the laws dictating establishing a *prima facie* case of obviousness are amply expounded in *Graham v. Deere*, 148 U.S.P.Q 459 (U.S. Supreme Court, 1966); *ACE Hospital Systems, Inc. v. Montefiore Hospital et al.*, 221 USPQ 929, 933 (Fed. Cir. 1984); and *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). These laws have not been superseded by a new standard of either an old and well-known choice test or an obvious design-choice test. Rejecting the claimed invention by these unfounded tests, the Office is deviating from *Graham v. Deere*, a case law established by the United States Supreme Court in 1966 and a series of case laws following *Graham* established by lower courts. Therefore, the Office has not used the correct test in attempt to establish a *prima facie* case of obviousness. Naturally, the Office also has not met the initial burden of proof that the claimed invention is obvious.

**Claim 19 is rejected under 35 USC §103(a) as being unpatentable over Itaya et al. (U.S. Patent No. 5,780,873).**

Since independent claim 14 is already shown to be patentably distinguished over the assert prior art, all claims dependent thereon, including claim 19, by virtue of inherency, is also

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patentably distinguished over the assert prior art.

Reconsideration and withdrawal of this rejection are respectfully requested.

**New Claim**

New claim 20 is added herein by Amendment. Entry and approval of this new claim are respectfully requested.

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**CONCLUSION**

In view of the aforementioned amendments and accompanying remarks, all pending claims are believed to be in condition for allowance, which action, at an early date, is requested.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 50-2866.

Respectfully Submitted,

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A handwritten signature in black ink, appearing to read "Michael Lau", is written over the printed name.

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